

# Ranking of Districts of Andhra Pradesh According to Sustainable Livelihood Security Indices Values

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

By computing the Sustainable Livelihood Security Indices, the current research study aimed to estimate and rank the sustainability in development and livelihood status of thirteen districts in Andhra Pradesh (SLSI). SLSI is a compound index made up of three indices: ecological security index (ESI), economic efficiency index (EEI), and social equity index (SEI). It is one of the most comprehensive yet straightforward indexes for assessing long-term security in livelihood in the research domain. For the time periods of 2006, 2016, and 2017 the districts of Andhra Pradesh were ranked in three categories depending on their level of development: high, medium, and low sustainable. According to the findings, the districts viz. West Godavari, East Godavari, Guntur, Krishna, and Prakasham have stayed in the high sustainable category without modification among time periods 2006, 2016, and 2017. Chittoor, S.P.S. Nellore, and Y.S.R. Kadapa were observed to be developing at a medium pace. In all three years, the districts of Srikakulam, Vishakapatnam, and Vizianagaram were observed to have a low degree of sustainability in SLSI category.

*Keywords: Sustainability; indicators; livelihood security and indices.*

## 1. INTRODUCTION

In 1972, during the UN Conference on the Human Environment in Stockholm, the concept - sustainable development earned its first substantial international acknowledgment. The UN coined the term "sustainable development" in its document "Our Common Future" [1]. Sustainable development, according to the World Commission on Environment and Development (WECD), is "development that meets current human needs without jeopardising future generations' ability to satisfy their own needs." It encompasses the interconnection and interplay of developments in environmental, economic, and social elements [2]. The concept of sustainability is always articulated in juxtaposition with the concept of livelihood. Livelihood is defined as all actions that are essential to lead a life by an individual or households through acquiring all the basic necessities like food, clothing, shelter, water etc., on a sustainable basis, Shyamalie et al. [3]. Sustainable livelihood explains the connection between people and their livelihood, Barela et al [4].

As the resources are scarce, there exists an imbalance between availability and actual requirement of goods and services created in catering the ever emerging needs of the population. This causes economic, environmental and social unsteadiness which consecutively affects the sustainability in development in a region or a nation. Sustainable livelihoods concept provides a ray of hope in attaining the development in a sustained manner with greater socio-economic equity. To attain sustainable development goals, a region's sustainability must be improved. Such progress is critical, especially in nations like India where biodiversity is abundant. Several critical elements, including economic, environmental, and social indicators, determine a region's long-term viability.

Swaminathan [5] proposed the SLSI as an operational measure for determining the occurrence of conditions necessary for sustainability in a specific location. The SLSI contains three interacting components that correspond to the three-dimensional idea of sustainability: ecological security, economic efficiency, and social equity.

Analyzing the degree of sustainability with the application of a composite indicator called the sustainable livelihood security index (SLSI) is imperative. This SLSI can be computed using

three indicators. The three indicators viz. Ecological Security, Economic efficiency and Social Equity, Amita et al [6] and Amarnath et al [7] were used for calculating SLISI for Andhra Pradesh state. The fifteen variables chosen to represent the three components or indicators of SLSI are listed below.

### 1.1 Ecological Security Indicators

Ecological security is crucial to control and enhance the resource base of the economy. Six variables included were,

1. Population density
2. Proportion of geographic area under forest
3. Cropping intensity
4. Livestock density
5. Net irrigated area
6. Population growth

### 1.2 Economic Efficiency Indicators

Economic efficiency directs the most efficient use of capital and human resources within the current technical conditions in order to cater the everyday needs of the society. Four variables included under this indicator were,

7. Total food grain yield
8. Total milk production
9. Net sown area
10. Fertilizer consumption

### 1.3 Social Equity Indicators

Social equity ensures a wide sharing of economic benefits to society in form of sustainable and secure livelihoods, particularly for the socio-economically disadvantaged. Five variables included under this indicator were,

11. Literacy rate
12. Female literacy rate
13. Rural road connectivity
14. Number of the commercial bank branches
15. Number of the primary health centres

Andhra Pradesh state was selected for the study because it has a high level of inequality, poor administration, over-exploitation of natural resources, and a rapidly growing population. These have posed a threat to the state's natural equilibrium, as well as socio-economic status of households in various districts. The state's

effective development of sustainable agriculture has been jeopardised by constantly rising inequality. The goal of this study is to create composite indices of three indicators: ecological security, economic efficiency, and social equity, to measure the SLS in districts of Andhra Pradesh. The sustainable livelihood security index is an effective instrument for assessing sustainability because it is simple, easy to understand and informative. It is useful for developing policies and plans to improve people's livelihood security by introducing new income-generating tactics and increasing their knowledge.

## 2. MATERIALS AND METHODS

The SLSI will be calculated using the ratio approach mentioned below, by using three indices: ESI, EEI, and SEI [8].

The SLSI was computed using the following ratio methodology, Singh et al [9].

$$SLSI_{ijk} = \frac{X_{ijk} - \min_k X_{ijk}}{\max_k X_{ijk} - \min_k X_{ijk}} \quad (1)$$

$$SLSI_{ijk} = \frac{\max_k X_{ijk} - X_{ijk}}{\max_k X_{ijk} - \min_k X_{ijk}} \quad (2)$$

Where,

i= Variables (1,2,3,.....,I),

j= Components (1,2,3,.....,J),

k= Districts (1,2,3,.....,K),

$X_{ijk}$  = Value of the  $i^{th}$  variable,  $j^{th}$  component of  $k^{th}$  district, and

$SLSI_{ijk}$  = Value of the index for the  $i^{th}$  variable representing the  $j^{th}$  component of the SLSI of  $k^{th}$  district, respectively.

Equation (1) applies to variables with positive SLSI implications, while equation (2) applies to variables with negative SLSI inference. The numerators in equation (1) represent the amount to which the  $k^{th}$  district outperforms worst performing regions in  $i^{th}$  variable representing  $j^{th}$  component of its SLSI. The range of a given variable across districts, is the numerator.

The indices for different components of SLSI Prakash et al [10], Kumar and Irfan [11] were calculated as a simple arithmetic mean of three indices with their respective variables after  $SLSI_{ijk}$  was calculated for all variables., *i.e.*

$$SLSI_{jk} = \frac{\sum_{i=1}^I SLSI_{ijk}}{I} \quad (3)$$

The equal weights of indices of corresponding representative variables will be used to compute three compound indices of SLSI, namely, ESI, EEI, and SEI, Krishna et al, [12]. The arithmetic mean of its component indices was used to generate a composite index, SLSI. The values range from 0 to 1. A score around 0 indicates a poor level of sustainability, whereas a value near one indicates a high level of sustainability, Sridhara et al. [13]. The research gap identified will be helpful to assess the level of indices to livelihood security for chosen districts. The parameters will be developed for assessing the indices to livelihood security with respect to the various kinds of livelihood security viz., food, education, economic, health and social security.

## 3. RESULTS AND DISCUSSION

From the Table 2. it is clearly noticed that, during the year 2006 districts were classified under low sustainability were Kurnool, Srikakulam, Vishakapatanam and Vizianagaram. Followed by chittoor, S.P.S.Nellore, Y.S.R. Kadapa and Anantapur as medium sustainable. Further, the remaining five districts viz., Guntur, East Godavari, Prakasham, Krishna and West Godavari were categorized under highly sustainable category.

In the year 2016, from Table 4. districts fall under low level of sustainability were Srikakulam, Kurnool, Vishakapatanam and Vizianagaram. While, in medium level of sustainability category districts placed were chittoor, S.P.S. Nellore, Anantapur and Y.S.R. Kadapa. Five districts viz., East Godavari, West Godavari, Guntur, Krishna and Prakasham were observed as highly sustainable.

In the year 2017, from Table 6. Districts fall under low level of sustainability were Anantapur, Srikakulam, Vizianagaram and Vishakapatanam. Followed by, districts with medium sustainability viz. Y.S.R. Kadapa, Kurnool, S.P.S. Nellore and chittoor. Further, remaining five districts viz., East Godavari, West Godavari, Guntur, Krishna and Prakasham were classified as highly sustainable. The similar results were also observed by Deshmukh et al. [14] and Mahima et al. [8] from their respective studies. Here, districts were classified for better interpretation under three levels of development as high, medium and low sustainable based on the overall Sustainable Livelihood Security Index score.

**Table 1. Districts classified based on level of development in ESI, EEI and SEI during year 2006**

<b>ESI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
East Godavari	1	Krishna	6	Vishakapatanam	10
West Godavari	2	Y.S.R. Kadapa	7	Chittoor	11
Srikakulam	3	S.P.S. Nellore	8	Kurnool	12
Guntur	4	Prakasham	9	Anantapur	13
Vizianagaram	5				
<b>EEI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
Guntur	1	Chittoor	6	Srikakulam	10
Kurnool	2	S.P.S. Nellore	7	Vizianagaram	11
Anantapur	3	East Godavari	8	West Godavari	12
Prakasham	4	Y.S.R. Kadapa	9	Vishakapatanam	13
Krishna	5				
<b>SEI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
Chittoor	1	Krishna	6	Srikakulam	10
West Godavari	2	East Godavari	7	Anantapur	11
S.P.S. Nellore	3	Vishakapatanam	8	Kurnool	12
Y.S.R. Kadapa	4	Guntur	9	Vizianagaram	13
Prakasham	5				

**Table 2. Districts classified based on level of development in SLSI during year 2006**

<b>SLSI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
Guntur	1	Chittoor	6	Kurnool	10
East Godavari	2	S.P.S. Nellore	7	Srikakulam	11
Prakasham	3	Y.S.R. Kadapa	8	Vishakapatanam	12
Krishna	4	Anantapur	9	Vizianagaram	13
West Godavari	5				

**Table 3. Districts classified based on level of development in ESI, EEI and SEI during year 2016**

<b>ESI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
East Godavari	1	Y.S.R. Kadapa	6	Chittoor	10
West Godavari	2	Krishna	7	Prakasham	11
Srikakulam	3	Vishakapatanam	8	Anantapur	12
Vizianagaram	4	S.P.S. Nellore	9	Kurnool	13
Guntur	5				
<b>EEI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
Guntur	1	East Godavari	6	Y.S.R. Kadapa	10
Prakasham	2	Chittoor	7	Srikakulam	11
Kurnool	3	S.P.S. Nellore	8	Vizianagaram	12
Anantapur	4	West Godavari	9	Vishakapatanam	13
Krishna	5				
<b>SEI</b>					
<b>High</b>	<b>Rank</b>	<b>Medium</b>	<b>Rank</b>	<b>Low</b>	<b>Rank</b>
West Godavari	1	Y.S.R. Kadapa	6	Anantapur	10
Krishna	2	Vishakapatanam	7	Srikakulam	11
Chittoor	3	Prakasham	8	Vizianagaram	12
East Godavari	4	Guntur	9	Kurnool	13
S.P.S. Nellore	5				

**Table 4. Districts classified based on level of development in SLSI during year 2016**

SLSI					
High	Rank	Medium	Rank	Low	Rank
East Godavari	1	Chittoor	6	Srikakulam	10
West Godavari	2	S.P.S.Nellore	7	Kurnool	11
Guntur	3	Anantapur	8	Vishakapatnam	12
Krishna	4	Y.S.R.Kadapa	9	Vizianagaram	13
Prakasham	5				

**Table 5. Districts classified based on level of development in ESI, EEI and SEI during year 2017**

ESI					
High	Rank	Medium	Rank	Low	Rank
East Godavari	1	S.P.S. Nellore	6	Vishakapatnam	10
West Godavari	2	Chittoor	7	Anantapur	11
Srikakulam	3	Y.S.R. Kadapa	8	Prakasham	12
Vizianagaram	4	Krishna	9	Kurnool	13
Guntur	5				

  

EEI					
High	Rank	Medium	Rank	Low	Rank
Kurnool	1	East Godavari	6	Srikakulam	10
Guntur	2	Y.S.R. Kadapa	7	Vizianagaram	11
Prakasham	3	West Godavari	8	Chittoor	12
Krishna	4	S.P.S. Nellore	9	Vishakapatnam	13
Anantapur	5				

  

SEI					
High	Rank	Medium	Rank	Low	Rank
West Godavari	1	Y.S.R. Kadapa	6	Anantapur	10
Krishna	2	Vishakapatnam	7	Srikakulam	11
Chittoor	3	Prakasham	8	Vizianagaram	12
East Godavari	4	Guntur	9	Kurnool	13
S.P.S. Nellore	5				

**Table 6. Districts classified based on level of development in SLSI during year 2017**

SLSI					
High	Rank	Medium	Rank	Low	Rank
East Godavari	1	Y.S.R. Kadapa	6	Anantapur	10
West Godavari	2	Kurnool	7	Srikakulam	11
Guntur	3	S.P.S. Nellore	8	Vizianagaram	12
Krishna	4	Chittoor	9	Vishakapatnam	13
Prakasham	5				

#### 4. CONCLUSION

Based on the findings, it can be concluded that the districts viz. West Godavari, East Godavari, Guntur, Krishna, and Prakasham have stayed under high-sustainability category across all the time periods, 2006, 2016, and 2017. In SLSI, there was no significant change in level of development in districts of Andhra Pradesh. From the SLSI, the districts viz. Chittoor, S.P.S. Nellore, and Y.S.R. Kadapa were identified as having a medium degree of development.

However, there identified no significant changes in the performance of districts. In addition, the SLSI category for Anantapur district was identified as medium. However, the district was deemed to be in the low SLSI category in 2017. Kurnool district, which had been ranked under low level of development improved to a medium level in 2017. In all three years, the districts, Srikakulam, Vishakapatnam, and Vizianagaram were observed to have a low degree of development in SLSI category. SLSI highlights the kind and form of policies that should be

implemented in each study area for improving livelihood security alongside the overall development priorities.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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